

VARIATION IN THE FLOWER OF THE WILD
CARROT, (*Daucus carota*, L.)

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This study has been made with respect to the presence, absence, and degree of development of the purple central flower or florets in the umbels of the wild carrot. There are added in connection those observations of early naturalists seemingly of interest. Flowers from two localities were considered, Cold Spring Harbor, N. Y. and Bellevue, Pa., with the following results.

Localities	No. specimens examined.	No. spec. with purple flower, flowers, or pig- mentation in cen- ter of umbel	No. spec. without purple flowers etc.
Cold Spring Harbor	3074	1317	1757
Bellevue	3074	292	2782
Totals	6148	1609	4539

From the preceding it becomes clear that at least so far as these localities are concerned, the purple flower when found is in the minority, although more abundant at Cold Spring Harbor. Gray's Manual states that the purple flower is usually present. Upon the basis of a count of a smaller number of specimens, some botanists have thought that the purple central flower is present in about 50% of the plants. The table already presented can give only a rough idea as to the variation in the number of purple flowers, and the distribution of purple pigment in the umbels of the plant. Frequently an entire umbellet is metamorphosed to produce a relatively gigantic purple flower, or there may be many smaller ones of a lighter color representing morphologically one umbellet. Occasionally two umbellets are transformed in a similar fashion. At the extreme, are cases reported me by botanists in which an entire quadrant of an umbel is pinkish, but the flowers otherwise not distinctive. I have seen but one similar case. The variation in the number of the purple flowers, and the distribution of purple pigment in the umbels of the plant is presented in the following compilation, inspection of which indicates further the greater degree of variation among the flowers at Cold Spring Harbor.

One umbellet or morphological equivalent purple pigmented,
No. of dark flowers on umbellets by classes.

Localities	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	19	23	26.
Cold Spring Harbor	1208	44	16	12	1	5	2	1		1	3	1	5	2	1	1	1	1
Bellevue	277	5	2		1	4	1	2										
Totals	1485	49	18	12	2	9	3	3		1	3	1	5	2	1	1	1	1

Two umbellets or morphological equivalents purple pigmented.
No. of dark flowers on umbellets by classes.

Localities	1	2	3	4
Cold Spring Harbor	16	3	2	1
Bellevue	0	0	0	0
Totals	16	3	2	1

Many botanists have doubtless forgotten Darwin's remarks on the flower of the carrot as given in his work, "Different Forms of Flowers on Plants of the Same Species." Darwin apparently did not make any study similar to this, but contented himself with gathering more general information and speculating upon the probable forces at work. He remarks that sometimes "two or three flowers next to the dark central one are so characterized." He believed that the latter did not make the umbel more conspicuous to insects, and while other investigators believed this flower to be neuter or sterile, he obtained seeds from it by fertilization. A micro-dissection made indicates that the seeds obtained from the purple flower are probably fertile, although the conclusive test would be germination.

Darwin did not consider the dark central flower to be of any importance, but considered it instead to represent a former condition of the species where the central flower alone was female. Its position was held to be the consequence of the fact that when irregular flowers become regular or peloric, they are apt to be central, and such peloric flowers owe their origin to arrested development or reversion. He additionally comments that in other species the larger central blossom may be correlated with the fact that it may be better nourished than the others, and may produce larger or different seeds. Of interest in connection would be some knowledge of the distribution of the purple central flower in the cultivated variety of the carrot, which botanists state to be derived from the wild form discussed. However, there is no record in standard works of horticulture as to the relative abundance of the purple flower in the cultivated variety, and seed growers state that to their best knowledge, (but without extended observation), the cultivated carrot

has the same percentage of purple florets as the wild one, although they have rarely seen more than one purple floret to the umbel. L. H. Bailey writes that in a good number of specimens of the cultivated carrot, there is no trace of a purple flower. This, however, proves nothing, for as we have seen many of the umbels of the wild carrot do not show it. Direct observation has been difficult, as most farmers do not grow their own seed.

Certain marked differences between the wild and cultivated strains, presumably genetic, stand forth. Such concern the characters of edibility, texture of the root, color, etc. It is interesting at this point to recall the experiments of Vilmorin, (*Le Bon Jardinier*, 1838, p. 16; 1840, p. 195), by which he showed that 3 or 4 generations of cultivation of the wild strain caused it to assume the characters of the cultivated form, especially the ones cited. He observed a gradual transition between the wild and cultivated forms. Vilmorin's experiments were vigorously attacked at the time, other botanists claiming that the results were due to accidental hybridization with the cultivated form, and that the characters of the wild strain were immutable ones. The burden of evidence since accumulated has been in favor of Vilmorin, if only on account of the method of origin of the cultivated carrot. While genetic studies on the wild carrot have been contemplated by some, they have not been made, and until such a time, it is not very profitable to speculate upon the causes of these observed differences. However in the light of our knowledge concerning other plants, one may well understand how differences in genetic strains may account for the qualitative and quantitative differences observed, provided the divergent variation, as manifested even in the small amount of material studied, be taken into consideration. Environment looms up as an important factor when the origin of the wild carrot is taken into consideration. Knuth (*Blütenbiologie III*), indicates species of aphids and wasps as the source of pollination while I have also observed a protectively colored spider and certain beetles in association. An additional clue possibly of aid in pursuing such a study would seem to lie in the fact that if one plant has an umbel with a dark central flower, nearly all the umbels on the same plant have it.

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